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STATISTICS OF "UNCONSCIOUS CEREBRATION."

BY CHARLES M. CHILD, Wesleyan University.

The present article is an attempt to give in a statistical form the results obtained from a set of questions on "Unconscious Cerebration." These questions were first issued by Mr. Francis Speir, Jr., of South Orange, N. J., and a part of the results of his investigation were published in the *Popular Science Monthly*, Vol. 32, p. 657, under the title, "*The Antechamber of Consciousness*." In order to the continuity of the inquiry it seemed best to re-issue the same set of questions, and these Mr. Speir very kindly furnished, together with the answers which had been returned to him. These answers were mostly from students of various colleges, and from persons in professional life. To these were added about a hundred more, all of college students, making the whole number of answers two hundred. These latter were collected by Professor A. C. Armstrong, Jr., of Wesleyan University, under whose direction the present investigation has been carried out. From these answers the statistics have been compiled, first, in general, with no regard to sex or age or other conditions; then the sexes were separated and the percentages for each were obtained; and third, the percentages were computed for the different ages.

In the two hundred papers there are one hundred and fifty-one from men and forty-nine from women. As regards age, the greater portion of the persons answering are between twenty and thirty years, and more of these are under twenty-five years than above. As the papers naturally fell into several divisions according to age, it seemed advisable to separate them as follows: first, those under twenty-five years; second, those between twenty-five and thirty years; and third, those over thirty years of age. The number of persons in each division is as follows: ninety are under twenty-five, thirty-two are between twenty-five and thirty, and forty-one are over thirty, besides which there are thirty-seven who do not give their ages.

Before giving the statistics a few words of explanation may be necessary. Each question is given separately, and following it are the percentages, together with any examples or remarks. A part of the examples quoted here are from the papers furnished by Mr. Speir and a few of them are given in his article; the others are from the papers collected by Professor Armstrong. In explanation of the figures it may be said here that in the tables the horizontal series headed "whole number answering," those answering "no" and "indefinite" have been computed only in the general division, and, when it is not otherwise stated, are percentages of the whole number of answers returned, i. e., two hundred. The figures in the different divisions headed "men," "women," etc., are, unless it is otherwise stated, percentages of the number of persons in each division. All the percentages are given as whole numbers, fractions of one per cent. being discarded. This sometimes causes a slight apparent discrepancy, as, for example, that noted below under the

first question. With this explanation and the notes given with each table, the figures will doubtless be clear. Only a part of the questions are given in tabular form, as it was unnecessary to give all the figures in every case. In the questions as given below the original order has been somewhat changed, and some portions, as well as some entire questions, which elicited answers of no essential value to the subject, have been omitted. The questions omitted are those numbered I., V. and XI. in Mr. Speir's original list. In other respects our list is identical with the original.

QUESTION I. 1. When you are unable to recall the name of something wanted and you say, "Never mind, it will occur to me," are you conscious of any effort of searching after it?

2. When you are, do you feel some trouble or weight in your effort?

3a. Does the idea ever seem to have come back spontaneously without being suggested by any perceived association of ideas?

b. Does such recovery of the lost idea ever come during sleep?

c. Does such recovery come after sleep?

d. Please give examples from your own experience, illustrating fully.

	1	2	3a	b	c
Whole number answering.	93	81	92	86	83
Those answering no.	21	12	11	68	31
Indefinite.	0	0	0	4	6
	Yes.	Yes.	Yes.	Yes.	Yes.
General.	72	68	81	17	57
Men.	72	68	77	18	60
Women.	73	67	84	15	54
Under 25 years.	72	72	79	10	51
Between 25 and 30 years.	78	66	84	33	56
Above 30 years.	66	61	71	21	65

In the first two columns there is an apparent discrepancy due to disregarding fractions of one per cent. In the first column the general percentage is 72, that of the men 72, while that of the women is not, as the general percentage would seem to indicate, 72, but 73. The same variation is seen in the second column. The percentages in the vertical columns under *b* and *c*, with the exception of the first three in each column, are percentages of the number of those in each division who answer 3a affirmatively.

In the answers to 1 there is little variation except in the last two divisions. Those between twenty-five and thirty show a distinct rise, and those above thirty a fall in their percentage. Under 2

those under twenty-five are above the general percentage, those between twenty-five and thirty somewhat below, and those above thirty still further below. In 3a the women show a higher percentage than the men, and here there is again the distinct rise between twenty-five and thirty, while those above thirty are considerably below those under twenty-five. Under b a somewhat larger percentage of men than of women answer affirmatively; the percentage of those between twenty-five and thirty is about double the general percentage, while that of those under twenty-five is less than the general percentage. In c also the percentage of affirmative answers is larger among the men than among the women. Here there is an increase in the percentage of affirmative answers with increase of age.

A few examples, which are among those given in the papers under the general subject of the spontaneous recovery of ideas, may be interesting and are given below.

1. "This morning I endeavored to recall the name of the characters I had read of in one of Scott's novels the night before. I could remember but one, and then only with much effort. During the morning I was unable to recall any other character by name, although constantly endeavoring to do so. After teaching a Sunday-school class, I walked home in the afternoon with my mother, and, without any effort, gave not only the names of the principal characters but many of the unimportant. I had not thought of the work for a number of hours."

2. "I was trying to think of the name of a book, and gave it up. About half an hour after, I was talking of something else when, all of a sudden, I blurted out the name without any conscious volition on my part, or without thinking anything about the book at all."

3. "I have tried to think of the name of a person without success in the evening, and the next morning have had it come to me without any connecting ideas at all, but it just seemed to 'pop' into my mind."

4. "I was telling my sister of a young lady, but I could not remember her name, though I thought I knew it. At last I had to give it up, and after a while forgot all about it, though I could not at first force myself to think entirely of other things. For a time I was dimly conscious of trying to remember. The next morning the name suddenly flashed across my mind, apparently without being suggested by anything else."

Many other examples are given, and a number state that the phenomenon is of very frequent occurrence. Several of the answers give empirical schemes for recalling the lost ideas, such as running through the letters of the alphabet, or working up from connected ideas to the one required.

QUESTION II. 1. Can you wake precisely at a given hour determined upon before going to sleep, without waking up many times before the appointed time?

2. If you can, (a) is this habitual, or do you often fail?

b. Are you conscious before waking of any feeling (describe it)?

c. Do you come directly from oblivion into consciousness?

	1	2a		b	c	
	Yes.	Seldom fail.	Often fail.	Yes.	Directly.	Gradually.
General	59	69	25	30	64	16
Men	62	69	28	33	56	16
Women	51	68	12	20	80	16
Under 25	68	66	33	33	62	15
Between 25-30	47	73	20	33	60	13
Above 30	61	68	12	16	64	20

Those who answer 1 are ninety-one per cent. of the whole number; those answering 1 in the negative, thirty-one per cent.; those answering indefinitely, one per cent. The percentages in the first vertical column are computed on the whole number in each division. The percentages in the other five columns are computed on the number of those in each division who answer 1 in the affirmative.

As regards the general percentages, the table shows that fifty-nine per cent. of those sending in papers possess the power of waking at a given time without being disturbed before. About two-thirds of these seldom or never fail in their attempt. Only about a third of them are conscious of any feeling as they wake, and about two-thirds wake directly. In the other division the important points appear to be as follows: A smaller percentage of women than of men possess the power of waking at a given time. Those of both sexes between twenty-five and thirty years are also far below the general percentage in the possession of this power. Those under twenty-five are above and those over thirty are about equal to the general percentage. There is a distinct decrease with increasing age in the percentage of those who often fail in their attempt to wake at a given time. A smaller percentage of women than of men wake with any special feeling, and those above thirty only about half as often as those below. A very large percentage of women wake directly, while men are rather below the general percentage. A larger proportion of persons above thirty than of those below wake gradually. The feeling of which some are conscious on waking is variously described, but is in nearly all cases a troubled feeling, as some describe it, "a feeling that I must wake," "that something must be done," "that it is time to get up," etc. In answering c some of those who say they wake directly have a very distinct feeling at the time of waking, so that b and c are not mutually exclusive.

A few of the examples given are quoted.

1. "Yes, at an early or unusual hour, by repeating the time to myself once or twice before going to sleep. I seldom wake before the hour determined upon and never fail then."

2. "I was intrusted by the attending physician with the administering of medicine to my wife, who was very dangerously ill. It was of the greatest importance that a certain medicine should be given every two hours as exactly as possible. I am an extraordinarily sound sleeper, but for six weeks I woke up every two hours

methodically, and never missed giving the medicine. I always came directly from oblivion into consciousness. I was as exact and methodical during the first few nights as at the last."

3. "I have never overslept when my mind was charged before retiring."

4. "I can always wake at any hour I desire, usually a few minutes before."

5. "Always can wake just five minutes before the hour at which I set the alarm."

6. "I recall one instance more remarkable than any other in my own case. I had been broken of my rest every night for a week or ten days, and one evening retired at about nine o'clock, giving directions to be called at twelve o'clock. I fell asleep at once, and slept till twelve without waking. At that time something seemed to tell me it was twelve o'clock. I seemed to come from perfect oblivion to perfect consciousness. I rose and dressed just as the clock struck twelve. I was under the impression that some one had called me, and was surprised to learn that no one had spoken to me.

QUESTION III. 1. When perplexed at your progress in any work (mathematical, professional, literary, chess, puzzles, etc.), have you ever left it unfinished and turned your attention to other things, and after some time, on voluntarily returning to it, have found yourself able at once to satisfactorily master it?

2. If you have, please give instances.

The answers to the first part are as follows: Ninety per cent. answer the question, seventy-seven per cent. affirmatively and twelve per cent. negatively. Of the men seventy-seven per cent. answer affirmatively, while the percentage in the case of the women is eighty. Those under twenty-five show a percentage of eighty-four answering affirmatively, those between twenty-five and thirty, eighty-one, and those above thirty only seventy-three, a distinct decrease with increase of age. About sixty-four per cent. of those answering are able to give examples of such an experience, while many others say they are sure they have observed something similar, but cannot recall instances.

A large number of the examples given relate to mathematics, a considerable number to the translation of foreign languages, and some to other work, such as essays, puzzles, etc. Some of the examples given will serve as illustrations:

1. "Often while playing chess or working an example I have not succeeded well. On returning after having left it for a while, what was difficult before seemed now very easy."

2. "In working mathematical examples in the evening I sometimes 'get stuck.' I leave it over night and take it up in the morning, and I often get the answer immediately. So in translation I find passages that I cannot get out. I study on them for a while and then leave them for several hours, or better sometimes days, and I can get them clearly."

3. "In writing music I often get to a stumbling-block, and try vainly to search for a chord or bar of music, but cannot find the thing I want. When it gets me very excited I leave it and go for a walk, and on coming back to work, I will most likely be able to write it out at once, seemingly without any work on my part; it is all ready for me to put down. I have frequently had the experience."

4. "I have come across a sentence that was particularly difficult in some Latin book I was reading, and have been unable to translate it. I have then turned my attention to abstruse problems in mathematics, and worked for some time. On returning to the

Latin I have often found it quite simple, and have sometimes translated it at sight."

QUESTION IV. 1. During sleep have you ever pursued a logical, connected train of thought, upon some topic or problem, in which you have reached some conclusion, and the steps and conclusion of which you have remembered on awakening?

2. During a half sleep?

3. If you have, how does the result appear when measured by your normal standard of day-time mental activity, with regard to accuracy, etc.?

4. Please give examples illustrating your meaning in full.

The general answers are as follows: Ninety-three per cent. answer the first section of the question, fifty-nine per cent. have had or recall no such experience, while thirty-one per cent. answer affirmatively. The second section is answered by eighty-two per cent., fifty-four per cent. in the negative, and twenty-four per cent. in the affirmative. Seventeen per cent. state that the results appear about as good or better than those reached in waking life, while eighteen per cent. reach conclusions which are far less accurate or absurd.

In the other divisions there is little variation, so it is unnecessary to give all the figures. There are, however, one or two points worthy of note. Only twelve per cent. of the women remember having any logical or connected train of thought in a half sleep, but the general percentage is twice as large. The low percentage of the women here may be connected with the fact that a very large percentage of women wake directly, as was shown in the fourth section of the second question. On the other hand, twenty-four percent. of the women reach results which are at least fairly accurate, this being somewhat above the general percentage, which is seventeen. The percentages of the different ages do not vary far nor with any regularity from the general percentages, and are not given.

Examples under this question are given by forty per cent. of those who have had an experience in sleep or in a half sleep; the following are quoted as showing the degree of accuracy sometimes attained:

1. "I have played a game of chess in my sleep. The game seemed in my sleep to be entirely completed. In the morning I remembered all but one or two plays, and when I played the game over in the morning it seemed consistent. I do not think that I had ever played that game (i. e., a game with those identical moves) before, and I could not play it now. I had been playing a great deal at the time, though, and of course had been thinking of chess when I went to bed."

2. "I have been puzzled by a problem in algebra which I found it impossible to solve, and let it rest over night, and while asleep have thought out each step and remembered it, and in the morning on trying the problem again, solved it without difficulty."

3. "Being greatly troubled over a problem in algebra just before going to sleep, and leaving the problem half finished, I dreamed the rest of the solution and obtained the correct result. On awaking, I remembered it, and it was correct."

4. "In my senior year at college I had an essay to write that troubled me unusually. After trying to decide upon the subject until quite late, I fell asleep and dreamed not only of the subject and analysis, but of all the details. The next morning I wrote out what I had dreamed, and found it far more satisfactory than anything I had ever done in the same line before."

"Two years before I had exactly the same experience about an equation in algebra which I worked out correctly in sleep."

5. "Have worked out many algebraic or geometrical problems during sleep. Have, when some years ago in Worcester Academy, scanned some fifty or seventy-five lines of Virgil not yet translated, except ten or fifteen lines; felt tired, went to bed, in sleep accurately translated all of it, and remembered it on waking."

6. "One evening had been working late on a hard geometry problem, and had failed to solve it. The next morning on awaking I remembered having dreamed of doing it and of obtaining the correct solution. I immediately went over the solution as I had in my dream, and found my reasoning all correct. If I had not thought of my dream immediately on waking up should probably have forgotten my solution, for it was even then hard to recall it."

7. "I had earnestly been trying to make a trial balance and had at last left off working, the summary of the Dr. and Cr. sides of the account showing a difference of £2 10s. 0d., the Dr. side being so much smaller. The error I had not found on Saturday night when I left the counting-house. On this same Saturday night I retired, feeling nervous and angry with myself. Some time in the night I dreamed thus: I was seated at my desk in the counting-house and in a good light; everything was orderly and natural, the ledger lying open before me. I was looking over the balance of the accounts and comparing them with the sums in the trial balance sheet. Soon I came to a small account having a debit balance of £2 10s. 0d. I looked at it, called myself sundry uncomplimentary names, spoke to myself in a deprecating manner of my own eyes, and at last put the £2 10s. 0d. to its proper side of the trial balance sheet, shut up and went home. Here the dream abruptly ended. I arose at the usual Sunday time, dressed carefully, breakfasted, went to call on some young lady friends, and to go to church especially with one of them. Suddenly the dream flashed on my memory. I went for the keys, opened the office, also the safe, got the ledger, turned to the folio my dream indicated. There was the account whose balance was the sum wanted, which I had omitted to put in the balance-sheet where it was now put, and my year's posting proved correct."

QUESTION V. 1. Have you ever been conscious of having discovered something new, e. g., an invention, a literary or poetical creation, or a mathematical solution, etc.?

2. If yes, then has this flashed into consciousness in the form of a clear conception?

3. How many instances can you give?

Seventy-two per cent. answer the first section of the question, forty per cent. negatively, and thirty-two per cent. affirmatively. Of those answering affirmatively, seventy-one per cent. have the idea flash into consciousness in a clear and distinct form. The percentages of both sexes are like the general percentages. Twenty-eight per cent. of those under twenty-five years of age think they have made such a discovery, thirty-two per cent. of those between twenty-five and thirty, and thirty-seven per cent. of those above thirty. Sixty-eight per cent. of those under twenty-five who have made such a discovery state that it came as a clear conception, seventy-five per cent. of those between twenty-five and thirty so state, and sixty per cent. of those above thirty.

These answers show, as might be expected, an increase in the number of such discoveries with increase of age. The percentages of those who answer the second section show an increase between twenty-five and thirty, while above thirty the percentage falls

below either of the others. Perhaps this may be due to the greater ability of the adult's fully developed mind to seize upon a hint as a basis, and work out from it the new idea.

A few of the examples given are quoted.

1. "I can instance as frequent the smallest kind of literary creation, forms of verbal expression, what one may call an apt phrase coming to my mind suddenly, uncalled for, as if uttered by some one else, of no use to me at the time or perhaps ever."

2. "Many instances of mathematical or psychological problems have suddenly flashed across my mind when on a totally different subject; sometimes very distinct and sometimes indistinct, which I afterwards developed into distinctness."

3. "Have often awaked with part of an essay all ready, with a letter wholly prepared; once or twice with a few stanzas composed on subjects that I had endeavored to treat in rhyme, once or twice also on subjects that I had not attempted or thought to write upon in verse."

4. "In one case I wrote a long piece of a rather satirical character, in easy rhythm, as fast as I could set down the words, and it needed little or no revision. Usually I am dissatisfied with my first copies."

QUESTION VI. 1. On seeing a sight (e. g., on visiting a strange place) or on hearing a sound (e. g., yourself or another making a remark), have you ever felt that you had under previous identical circumstances experienced the same before?

2. If you have, then give instances.

3. Describe any general feeling that accompanies this flash of half intelligence.

	1 Yes	3 Describe some feeling.
General	59	67
Men	56	65
Women	71	71
Under 25	69	68
Between 25 and 30	41	92
Above 30	63	50

Eighty-eight per cent answer the first part of the question, twenty-seven per cent answering negatively, and fifty-nine per cent affirmatively. The percentages in the second vertical column are computed on the number of those in each division who answer 1 affirmatively.

As regards the first part of the question, women show a larger percentage in the affirmative than men. Those under twenty-five show a larger percentage than any other age, and one which is above the general percentage, while those between twenty-five and thirty show a much smaller percentage than any other age. In the third section the women again show a higher percentage than the men; those of both sexes between twenty-five and thirty give a very high percentage, and those above thirty are much below the general percentage. The answers to this section vary greatly as regards the nature of the accompanying feeling. Many call it a feeling of annoyance, perplexity or surprise. Some say they have almost a feeling of awe, and one or two call it uncanny.

Sixty-three per cent. of those who recall such an experience are able to give examples. The greater part of these relate to sights or sounds, i. e., remarks, etc., heard or scenes visited, pictures seen and the like. Two persons, however, state that they have had this experience in connection with the sense of smell, but do not give definite examples. A few of the instances related will serve to show their nature:

1. "I have purchased a Chinese umbrella-stand which I know I never possessed before, nor can I recall ever having seen one like it. Yet it is impossible for me to see it without feeling that I have previously owned and used it."

2. "When driving over a new road in a part of the country where I had never been before, and of which I had never seen pictures, it seemed as though I had been over it before under perfectly identical circumstances."

3. "On meeting strange people, a word or look will convince me that I have seen the same thing done by the same person in similar circumstances."

4. "Sometimes I find places which seem to be places I have seen before, and I often find them to be places I have dreamed about."

QUESTION VII. 1. Do you dream?

2. If you do, then (a) give any characteristic peculiar to dreaming on the right side, left side and back.

b. Are you conscious of a moral sense during sleep?

	1	2a	b
Whole number answering	96	79	78
Those answering no	2	26	24
Indefinite	0	22	6
	Yes	More or worse on back	Yes
General	94	31	48
Men	93	28	46
Women	94	39	54
Under 25	98	25	47
Between 25 and 30	87	50	57
Above 30	85	29	43

All the percentages in the second and third vertical columns of figures are computed on the number of those answering the first section of the question affirmatively. The first four in each column are computed on the number in the general division answering 1 affirmatively, and the other five on the number answering in each division respectively, the first section affirmatively.

The sexes show no appreciable variation from the general percentage in the first section. The second section shows that the dreams of women are more affected by position than those of men, and the third section shows that a larger percentage of women than of men are conscious of a moral sense when dreaming. In the answers from those of different ages, there is a continuous decrease with increasing age in the number of those who dream. Those under twenty-five are least affected by position. Those over thirty show a somewhat higher percentage, and those between twenty-five and thirty give a percentage nearly double that of the other two divisions. Again, in the answers to the third section of the questions, there are more between twenty-five and thirty who are conscious of a moral sense than in any other division, while the percentage of those over thirty years of age is the lowest of all.

Besides these answers, two persons state that their dreams are unpleasant when they sleep on the left side as well as when on the back, and one person says he dreams less when lying on the back than in any other position. Two others answer that any unusual or cramped position seems to produce disagreeable dreams.

QUESTION VIII. 1. Do you talk in your sleep?

2. If you do, answer from your family report:

a. Are you able (if accosted when so talking) to answer intelligently questions put to you? If yes, then (b) do you answer any questions, or only questions on the subject that you are talking about?

	1	2a	b	b
	Yes	Yes	Any	Only on subject
General	40	37	27	43
Men	41	32	25	55
Women	37	56	30	20
Under 25	58	42		
Between 25 and 30	19	17		
Above 30	19	37		

Eighty-nine per cent. of the whole number answer the first section, forty-eight per cent. negatively, and forty per cent. affirmatively. The percentages in the first column are computed on the number of persons in each division; those in the column headed 2a on the number in each division who answer 1 affirmatively, and the two columns under b on the number in each division who answer 2a affirmatively.

The figures show that a rather larger proportion of men than of women talk in their sleep, while the percentage of women who answer questions when asleep is much larger than that of the men. About twice as many men answer only on the subject concerning which they are talking, as on any subject, but with the women the percentage of those who answer on any subject exceeds the other. The percentage of those who talk in their sleep is much higher among those under twenty-five than among those above. In the ability to answer questions, those under twenty-five stand highest and those between twenty-five and thirty the lowest. The figures under b are not given for the different ages, as they show no special variation from the general percentage.

The existence of phenomena like the above has long been admitted by psychologists. Sir William Hamilton, to go no further back, in Lecture XVIII. of his *Lectures on Metaphysics*, collected and discussed a number of examples of them; and Carpenter, in his *Mental Physiology*, also devotes a chapter to the subject. These examples and discussions, unscientific though some of them were, led the way to further investigation, and are abundantly confirmed by later works on the subject. That there is a field of mental or cerebral activity which lies without the limits of consciousness, is regarded as an established fact. This paper has attempted to show the relative frequency of the phenomena involved in this "unconscious cerebration," and the results reached give an experimental verification of the psychological principles which others have maintained. The general sources of error in statistics of this nature are well known, and of course enter here to a greater or less extent. Some who answer evidently do not understand the questions and some are in doubt as to their answers. A number answer who are unable to give definite examples, but "think" they have noted such an experience. But there are, on the other hand, reasons which are sufficient to counterbalance these sources of error, and to give the results undoubted validity. First, there is in

most cases a large percentage of those who state that they have certainly experienced the phenomena under discussion, and a large proportion of these are able to give definite examples in confirmation of their statement. Again, there is often a considerable number who state definitely that they have had no such experience as the question indicates, and this, in a negative way, still further confirms the results.

A difficulty of considerable importance in the collection of statistics, is that of selecting a body of persons who will give average results. This difficulty has been felt to some degree in the present inquiry. The answers are from persons more or less accustomed to mental work and self-observation; nearly one-half of those who answer are under twenty-five years of age, while thirty-seven do not give their ages at all; and there are three times as many men as women. But the error arising from these facts cannot be very large, and may probably be disregarded, as the persons from whom these statistics come are in other respects a body well fitted for such purposes. They are largely college students and, moreover, not special individuals among the students, but entire classes, thus giving a body of persons selected perfectly at random, and likely to yield average results.

It is possible, then, in spite of the various sources of error, to form a conclusion regarding the general frequency of the various phenomena under discussion, as well as in the different sexes and in those of different ages. In general terms, it may be said that the answers of the women show that they have less experience with the results of unconscious cerebration than men. Possibly this is explained by less observation of such matters in their case. Concerning the different ages, there is usually, where the element of the mind's development and increase in maturity does not enter, a decrease with increasing age in the frequency of conscious results of unconscious action, which is frequently interrupted between twenty-five and thirty years of age. This interruption occurs so often that it scarcely seems due to accident or error, and yet no adequate explanation for it can be offered here. It is possible that the decrease with increasing age is due to the decreasing plasticity of the brain molecules or brain cells under normal conditions. Aside from the special results concerning each question, it does not seem that the figures warrant any further or more definite conclusions.